Earth's Structure and Processes

8-3 The student will demonstrate an understanding of materials that determine the structure of Earth and the processes that have altered this structure. (Earth Science)

8.3.4 Explain how igneous, metamorphic, and sedimentary rocks are interrelated in the rock cycle.
Taxonomy level: 2.7-B Understand Conceptual Knowledge

Previous/future knowledge: Rocks were introduced in 1st grade (1-4.1, 2) as materials from Earth that can be classified by their physical appearance. In 3rd grade (3-3.1), students classified rocks as sedimentary, igneous, and metamorphic based on their properties. No additional study of rocks has been done since 3rd grade. The concept of a rock cycle is new to this grade. The classification of minerals and rocks based on physical and chemical properties is part of high school Earth Science (ES-3.7)

It is essential for students to know that there are three large classifications of rocks – igneous, metamorphic, and sedimentary. Each type of rock is formed differently and can change from one type to another over time.

Igneous
- Forms when molten rock (magma) cools and hardens.
- If cooling takes place slowly beneath Earth's surface, the igneous rock is called *intrusive*.
- If the cooling takes place rapidly on Earth's surface, the igneous rock is called *extrusive*.

Metamorphic
- Forms when rocks are changed into different kinds of rocks by great heat and/or pressure – they are heated, squeezed, folded, or chemically changed by contact with hot fluids.

Sedimentary
- Forms from the compaction and/or cementation of rock pieces, mineral grains, or shell fragments called *sediments*.
- Sediments are formed through the processes of weathering and erosion of rocks exposed at Earth's surface.
- Sedimentary rocks can also form from the chemical depositing of materials that were once dissolved in water.

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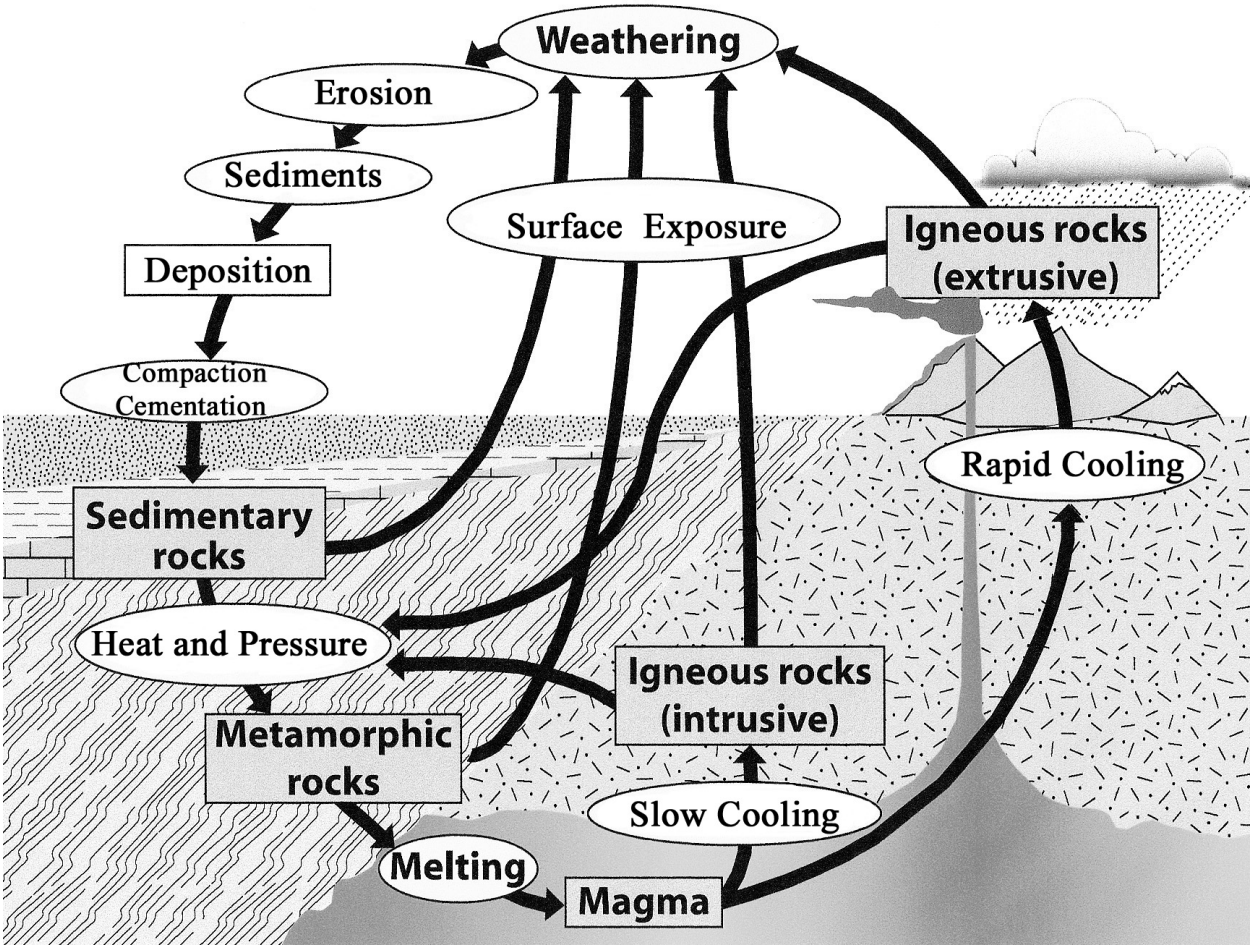
The rock cycle is an ongoing process. The sample diagram illustrates the series of natural processes that can change rocks from one kind to another:



It is not essential for students to classify individual rocks, chemical composition, or the minerals from which they are made, based on their properties.

Assessment Guidelines:
The objective of this indicator is to *explain* the interrelationships of the three rock types; therefore, the primary focus of assessment should be to construct a cause-and-effect model about the forming of a rock based on the process(es) involved. However, appropriate assessments should also require students to *interpret* a rock cycle diagram; *compare* how rocks can be changed by particular processes; or *identify* a rock type by the method with which it is formed.